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(54) **Refrigerant fluid trap for vacuum evaporators for the deposit of thin metal films.**

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FR-A- 1 369 360
FR-A- 1 381 199
FR-A- 2 558 735
GB-A- 1 076 428

PATENT ABSTRACTS OF JAPAN, vol. 9, no.
200 (C-298)[1923], 16th August 1985; & JP-
A-60 67 657 (TOSHIBA K.K.) 18-04-1985

PATENT ABSTRACTS OF JAPAN, vol. 10, no.
107 (C-341)[2164], 22nd April 1986; & JP-A-60
238 476 (HITACHI SEISAKUSHO K.K.)
27-11-1985

PATENT ABSTRACTS OF JAPAN, vol. 10, no.
310 (C-379)[2366], 22nd October 1986; & JP-

A-61 120 629 (SEIKO INSTR) & ELECTRON-
ICS LTD) 07-06-1986

Experimentelle Technik der Physik, XVIII,
1970, No. 1/2, pages 135-140

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Description

The present invention relates to a refrigerant fluid trap for vacuum evaporators for the deposit of thin metal films.

Evaporators for the above use are known for example from JP-A 6 067 657 and JP-A 60 238 476, which include in a vacuum chamber a source of evaporation of the electronic gun, boat or filament type placed in front of the receiving substrate.

A suitable gettering trap is also included in said evaporators to capture the condensable vapors (water or other) and any possible contaminants which could otherwise compromise the vacuum state and hence deposit of the desired metal.

A shortcoming of known traps is represented by their inability to operate in close contact with the source of evaporation because of their conformation. As a result trapping efficiency is not high.

The object of the present invention is to achieve a refrigerant fluid trap which for a given size would have higher trapping efficiency.

In accordance with the invention said object is achieved by a trap as defined in claim 1.

Preferably in said interior space there is housed a titanium evaporation source which considerably increases gettering properties toward residual gasses such as oxygen, nitrogen and others.

A possible embodiment of the trap in accordance with the invention is illustrated as example in the annexed drawings wherein:

Fig. 1 shows a top view of a trap in accordance with the invention,

Fig. 2 shows a cross section of said trap along line II-II of Fig. 1.

Figs. 1 and 2 show a trap usable either with a boat supply source, a filament supply source or an electron gun supply source.

It has a U structure 1 through which passes a duct 2 designed for the passage of a refrigerant fluid, in particular liquid nitrogen. Reference numbers 3 and 4 indicate the inlet and outlet mouths of the duct 2.

The U structure 1 forms an interior space 5 in which can be housed either an evaporation source of metal to be deposited or an evaporation source of titanium designed to help the trapping of oxygen, nitrogen and other residual gases by the cold walls of the trap.

In the example illustrated the two sources are indicated with reference numbers 6 and 7 and assumed to be associated with a boat-evaporator 8.

The trap shown in Figs. 1 and 2 can be used in a vacuum evaporator inside a suitable bell-shaped vacuum chamber and in front of the silicon substrate designed to receive the evaporated metal.

Circulation of the refrigerant fluid in the duct 2 causes the peripheral structure 1 of the trap to behave as a cold chamber, causing condensation of condensable vapors such as water. As mentioned above the titanium evaporated from the source 7 helps trapping of residual gasses such as oxygen and nitrogen.

The main advantages of the trap illustrated in the drawings and in general of the trap in accordance with the invention may be summarized thus: (a) the enveloping form with an interior space allows the trap to operate in close contact with the evaporation source of the metal to be deposited; (b) it is possible to vary the extent of the active surface, e.g. by providing it with fins, to increase condensation efficiency toward water or other condensable vapors; (c) coupling to a titanium source makes it possible to trap residual gasses such as oxygen and nitrogen, thus obtaining a very high and particularly clean (free of contaminants) vacuum and with low oxygen content; and (d) the getter effect appears, predominantly for oxygen, in the presence of evaporation sources of nickel, chromium or other elements having an affinity with oxygen, since the trap behaves as a cold wall.

Claims

1. A refrigerant fluid trap associated to an evaporation source (6) for a metal to be deposited in a vacuum evaporator for deposition of thin metal films, comprising a structure (1) of U-like form including an inner duct (2) for a refrigerant fluid, said structure defining a trapping space (5) in which said evaporation source (6) is arranged, characterized in that the axis of said inner duct (2) extends in a single plane perpendicular to the evaporation axis of the evaporation source (6) and said U-like structure (1) has a substantially flat form in said plane.
2. A trap according to claim 1, wherein an auxiliary titanium evaporation source (7) is further arranged in said trapping space (5) adjacent said evaporation source (6).
3. A trap according to claim 1, wherein an auxiliary evaporation source (7) for an element having affinity with oxygen, such as nickel and chromium, is further arranged in said trapping space (5) adjacent said evaporation source (6).

Patentansprüche

1. Kühlmittelfluid-Abscheider, der einer Verdampfungsquelle (6) für ein Metall zugeordnet ist, das in einem Vakuumverdampfer zum Auf-

dampfen dünner Metallschichten aufzudampfen ist, mit einer U-förmigen Konstruktion (1) mit einem inneren Kanal (2) für ein Kühlmittelfluid, wobei die Konstruktion einen Abscheideraum (5) definiert, in dem die Verdampfungsquelle (6) angeordnet ist, 5
dadurch gekennzeichnet, daß sich die Achse des inneren Kanals (2) in einer einzigen Ebene rechtwinklig zu der Verdampfungsachse der Verdampfungsquelle (6) erstreckt und daß die 10
U-förmige Konstruktion (1) in dieser Ebene eine im wesentliche ebene Gestalt besitzt.

2. Abscheider nach Anspruch 1, 15
bei dem außerdem eine Titan-Hilfsverdampfungsquelle (7) in dem Abscheideraum (5) nahe der Verdampfungsquelle (6) angeordnet ist.
3. Abscheider nach Anspruch 1, 20
bei dem außerdem eine Hilfsverdampfungsquelle (7) für ein Element mit Affinität zu Sauerstoff, wie z.B. Nickel und Chrom, in dem Abscheideraum (5) nahe der Verdampfungsquelle (6) angeordnet ist. 25

Revendications

1. Piège refroidi par fluide associé à une source (6) d'évaporation pour un métal devant être 30
déposé dans un évaporateur sous vide pour le dépôt de films métalliques minces, comprenant une structure (1) de forme analogue à un U, comportant un conduit intérieur (2) pour un fluide réfrigérant, ladite structure définissant un 35
espace de piégeage (5) dans lequel ladite source (6) d'évaporation est disposée, caractérisé en ce que l'axe dudit conduit intérieur (2) s'étend dans un seul plan perpendiculaire à l'axe d'évaporation de la source (6) d'évaporation, et ladite structure (1) analogue à un U 40
présente une forme sensiblement plate dans ledit plan.
2. Piège selon la revendication 1, dans lequel une 45
source auxiliaire (7) d'évaporation de titane est en outre disposée dans ledit espace (5) de piégeage à proximité immédiate de ladite source (6) d'évaporation. 50
3. Piège selon la revendication 1, dans lequel une 55
source auxiliaire (7) d'évaporation pour un élément ayant une affinité avec l'oxygène, tel que du nickel et du chrome, est en outre disposée dans ledit espace (5) de piégeage à proximité immédiate de ladite source (6) d'évaporation.

Fig.1

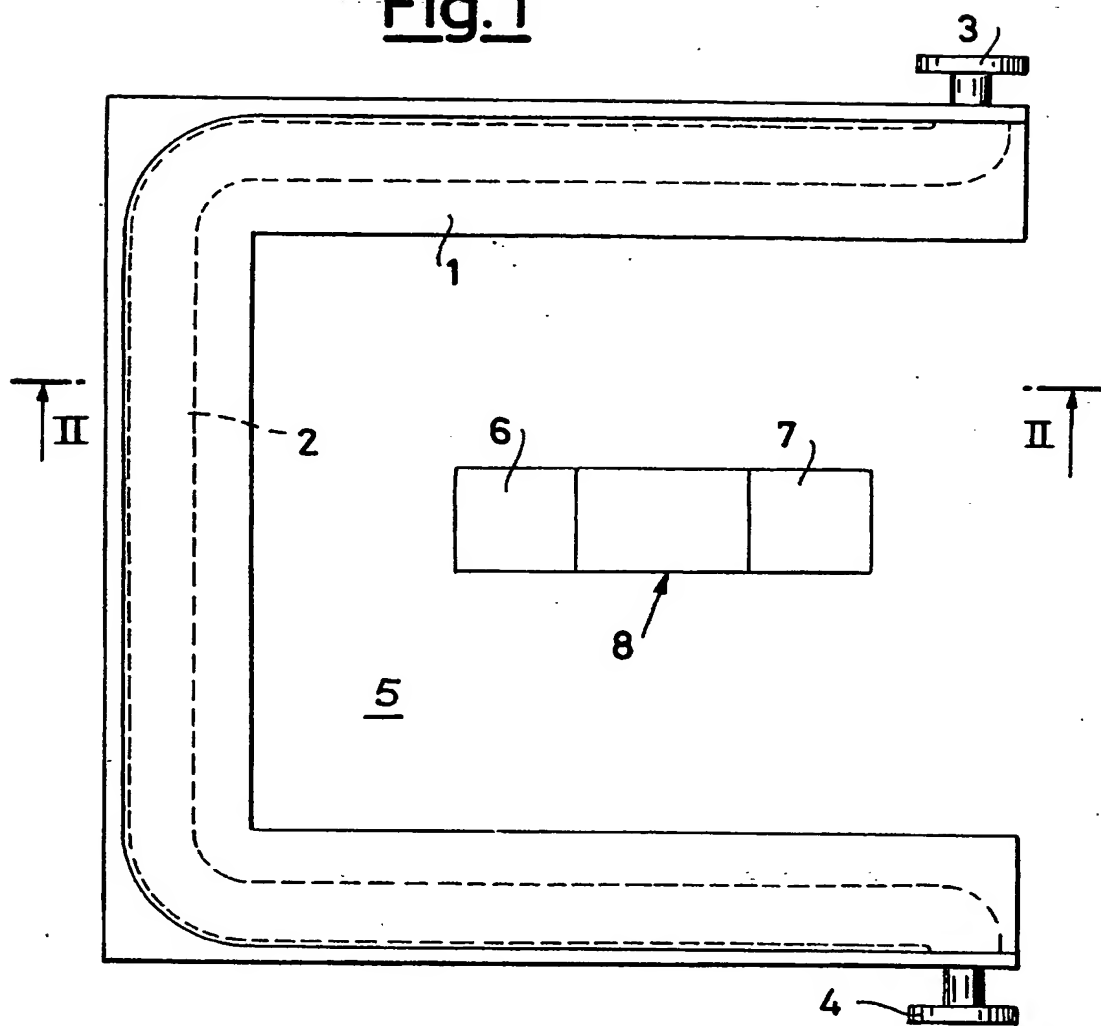


Fig.2

